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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
LE, DUY K	

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2685	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/660,467	SETO ET AL.	
	Examiner	Art Unit	
	Duy K Le	2685	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *15-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 September 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 3,4,5,8.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1 to 14 in Paper No. 7 is acknowledged.

Drawings

2. Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 12 is rejected under 35 U.S.C. 102(b) as being anticipated by Okada et al. (EP 0843380 A2).

As to claim 12, Figure 5 in Okada shows a radio communication system comprising:

a base station (2B) provided with a variable directional array antenna whose directivity changes by an electric signal for supplying power to a plurality of antenna elements (see Col. 7, lines 37-57); and

a control station (1B) provided with a signal calculation circuit (20) for performing weighting of electric signal applied to said plurality of antenna elements (see Col. 8, lines 5-13),

said base station being connected to said control station via an optical transmission line (4) (see Col. 8, lines 5-13),

wherein the electric signal for supplying the power to said plurality of antenna elements is transmitted to said base station from said control station via said optical transmission line ("a signal for amplitude and phase control at respective element antennas 3i (hereinafter referred to as "control signal") is transmitted from a control station 1B to a radio base station 2B, and a radio signal having a predetermined amplitude and phase is generated in the radio base station" (Col. 7, lines 30-36)), and

the signal transmitted via said optical transmission line is constituted by multiplexing an electric signal obtained by subjecting the electric signal for supplying the power to said plurality of antenna elements to frequency conversion to different frequencies by a plurality of local oscillator outputs different in frequency from one another, with said local oscillator outputs ("the generated amplitude and phase information is combined with electric signals by the combiner 19 (through subcarrier multiplexing, for example), and then the combined signals are transmitted through the optical fiber 4" (Col. 8, lines 9-13)).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-7, 10, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0843380 A2 to Okada et al. in view of Emura (U.S. Patent 5,424,864).

As to claim 1, Figure 2 in Okada shows a radio communication system comprising a base station (2) for performing radio communication with a radio communication terminal; and a control station (1) connected to the base station via an optical transmission line (4) (see Col. 5, line 7 to Col. 6, line 38)

said base station comprising:

a variable beam pattern array antenna which comprises a plurality of antenna elements (3a, 3b, …, 3n) and which can change directivity in accordance with a position of said radio communication terminal;

base station side frequency conversion means (23a, 23b, …, 23n) configured to subject received signals received from said radio communication terminal via said plurality of antenna elements to frequency conversion to different bands ("the antenna element drivers 23i each include mixers, amplifiers and a circulator, and serve to drive the element antennas 3i. The mixer serves to convert the frequency of radio waves from a 1.5 GHz band to a 60 GHz band for radiation of the radio waves from the element antenna 3i" (Col. 5, lines 28-33));

said control station comprising:

control station side frequency conversion means configured to branch said sub-carrier multiplexing signal transmitted from said base station via said optical transmission line to signals received by said plurality of antenna elements, and performing the frequency conversion to obtain the signals of the same frequency band for each of the branched signals ("the control

station 1 includes a modulator 15 and a demodulator 16 each connected to a public network, a local oscillator 14, mixers 17, circulators, a feed distributor 13, variable attenuators, phase shifters, photoelectric conversion elements and a wavelength multiplexer 11" (Col. 5, lines 34-39). "The demodulator 16 performs demodulation in reverse to the modulation. The mixers 17 convert the $\pi/4$-QPSK-modulated signals to the intermediate frequency band (1.5 GHz band) signals by utilizing signals generated by the local oscillator 14. The feed distributor 13 divides the intermediate frequency band signals into n group. The n groups of signals are respectively imparted with predetermined amplitudes and phases by the variable attenuators and the phase shifters, and then converted into intensity-modulated signals modulated with light beams of different wavelengths by the photoelectric conversion elements. These light beams are transmitted from the wavelength multiplexer 11 via an optical fiber 4" (Col. 5, line 51 to Col. 6, line 7));

beam calculation means (12) configured to obtain a weighting coefficient to control directivity of said plurality of antenna elements ("the beam control computation portion 12 generates a control signal for controlling the phase shifters and the variable attenuators for beamforming of the radio base station antenna toward the estimated direction" (Col. 6, lines 26-30));

weighting means configured to perform weighting based on said weighting coefficient ("variable attenuators" in Col. 6, lines 26-30)); and

received signal generation means configured to generate the received signal by combining said branched signals that frequency is converted by said control station side

frequency conversion means and weighting is performed (see Col. 5, line 51 to Col. 6, line 7 and Figure 2).

However, the Okada reference does not disclose sub-carrier multiplexing signal generation means configured to combine a plurality of signals subjected to the frequency conversion by said base station side frequency conversion means to generate a sub carrier multiplexing signal; and base station side transmission means configured to transmit said sub carrier multiplexing signal to said control station via said optical transmission line,

The Emura reference teaches sub-carrier multiplexing signal generation means configured to combine a plurality of signals subjected to the frequency conversion by said base station side frequency conversion means to generate a sub carrier multiplexing signal ("the frequency-converted signals from frequency converters 211 to 214 may be electrically combined into a combined electrical signal which may then be converted to an optical signal by a single electrical-to-optical converter, rather than being converted to optical signals by each of electrical-to-optical signals by each of electrical-to-optical converters 221 to 224 as in the illustrated embodiment" (Col. 6, lines 58-65)); and base station side transmission means configured to transmit said sub carrier multiplexing signal to said control station via said optical transmission line (see Col. 6, lines 58-65 and Figure 1)).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Okada wherein the base station comprises sub-carrier multiplexing signal generation means configured to combine a plurality of signals subjected to the frequency conversion by said base station side frequency conversion means to generate a sub-carrier multiplexing signal, as taught by Emura, in order to generate a combined

electrical signal which may then be converted to an optical signal by a single electrical-to-optical converter for transmission.

As to claim 2, Figure 2 in Okada shows a radio communication system comprising a base station (2) including a variable beam pattern array antenna which has a plurality of antenna elements (3a, 3b, …, 3n) and which can change directivity in accordance with a position of a radio communication terminal; and a control station (1) connected to the base station via an optical transmission line (4) (see Col. 5, line 7 to Col. 6, line 38),

said control station comprising:

control station side branching means configured to branch a signal correlated with a transmitted signal transmitted to said radio communication terminal from said variable beam pattern array antenna for said plurality of antenna elements ("the control station 1 includes a modulator 15 and a demodulator 16 each connected to a public network, a local oscillator 14, mixers 17, circulators, a feed distributor 13, variable attenuators, phase shifters, photoelectric conversion elements and a wavelength multiplexer 11" (Col. 5, lines 34-39). "The demodulator 16 performs demodulation in reverse to the modulation. The mixers 17 convert the $\pi/4$-QPSK-modulated signals to the intermediate frequency band (1.5 GHz band) signals by utilizing signals generated by the local oscillator 14. The feed distributor 13 divides the intermediate frequency band signals into n group. The n groups of signals are respectively imparted with predetermined amplitudes and phases by the variable attenuators and the phase shifters, and then converted into intensity-modulated signals modulated with light beams of different wavelengths by the photoelectric conversion elements. These light beams are transmitted from the wavelength multiplexer 11 via an optical fiber 4" (Col. 5, line 51 to Col. 6, line 7));

weighting means configured to weight based on a weight control signal for the signals of the respective antenna elements relating to the transmitted signal transmitted from said variable beam pattern array antenna to said radio communication terminal ("the beam control computation portion 12 generates a control signal for controlling the phase shifters and the variable attenuators for beamforming of the radio base station antenna toward the estimated direction" (Col. 6, lines 26-30));

control station side frequency conversion means configured to convert frequency to respective different bands ("the feed distributor 13 divides the intermediate frequency band signals into n group. The n groups of signals are respectively imparted with predetermined amplitudes and phases by the variable attenuators and the phase shifters, and then converted into intensity-modulated signals modulated with light beams of different wavelengths by the photoelectric conversion elements. These light beams are transmitted from the wavelength multiplexer 11 via an optical fiber 4" (Col. 5, line 55 to Col. 6, line 7));

said base station comprising:

base station side branching means (21) configured to branch said sub-carrier multiplexing signal transmitted from said control station via said optical transmission line for said plurality of antenna elements ("the wavelength multiplexer 21 serves to divide a light beam transmitted through an optical fiber on a wavelength basis and includes, for example, optical filters and photo-couplers" (Col. 5, lines 25-28)); and

base station side frequency conversion means (23a, 23b, …, 23n) configured to subject the respective signals branched by said base station side branching means to the signals of the same frequency band ("the antenna element drivers 23i each include mixers, amplifiers and a

circulator, and serve to drive the element antennas 3i. The mixer serves to convert the frequency of radio waves from a 1.5 GHz band to a 60 GHz band for radiation of the radio waves from the element antenna 3i" (Col. 5, lines 28-33)), wherein

said plurality of antenna elements (3a, 3b, ..., 3n) transmit the respective signals subjected to the frequency conversion by said base station side frequency conversion means to said radio communication terminal (see Col. 5, lines 28-33).

However, the Okada reference does not disclose sub-carrier multiplexing signal generation means configured to combine the respective signals converted to the different bands subjected to the frequency conversion by said control station side frequency conversion means to generate a sub-carrier multiplexing signal; and transmission means configured to transmit said sub-carrier multiplexing signal to said base station via said optical transmission line.

The Emura reference teaches sub-carrier multiplexing signal generation means configured to combine the respective signals converted to the different bands subjected to the frequency conversion by said control station side frequency conversion means to generate a sub-carrier multiplexing signal ("the frequency-converted signals from frequency converters 211 to 214 may be electrically combined into a combined electrical signal which may then be converted to an optical signal by a single electrical-to-optical converter, rather than being converted to optical signals by each of electrical-to-optical signals by each of electrical-to-optical converters 221 to 224 as in the illustrated embodiment" (Col. 6, lines 58-65)); and transmission means configured to transmit said sub-carrier multiplexing signal to said base station via said optical transmission line (see Col. 6, lines 58-65 and Figure 1)).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Okada wherein the control station comprises sub-carrier multiplexing signal generation means configured to combine the respective signals converted to the different bands subjected to the frequency conversion by said control station side frequency conversion means to generate a sub-carrier multiplexing signal; and transmission means configured to transmit said sub-carrier multiplexing signal to said base station via said optical transmission line, as taught by Emura, in order to generate a combined electrical signal which may then be converted to an optical signal by a single electrical-to-optical converter for transmission.

As to claims 3 and 4, Okada-Emura discloses the radio communication system according to claims 1 and 2 wherein said base station further comprises:

a first local oscillator (22) for supplying a first reference signal as a frequency conversion reference to said base station side frequency conversion means (see Col. 7, lines 30-42),

said control station further comprises:

a second local oscillator(14) for supplying a second reference signal as the frequency conversion reference to said control station side frequency conversion means (see Col. 7, lines 30-36), and

said second local oscillator outputs said second reference signal which has a predetermined phase relation with said first reference signal so that said control station side frequency conversion means output the signal maintaining a relative phase difference among the respective received signals of said plurality of antenna elements (see Col. 7, lines 43-50).

As to claim 5, Okada-Emura discloses the radio communication system according to claim 1 wherein said base station comprises:

reference signal generation means configured to generate a reference signal (Emura: see Col. 5, line 60 to Col. 6, line 8); and

reference signal transmission means configured to directly transmit the generated reference signal for superposing the reference signal to said sub-carrier multiplexing signal and transmitting the signal to said control station (Emura: see Col. 6, lines 58-65), and

said base station side frequency conversion means and said control station side frequency conversion means perform the frequency conversion based on the same reference signal generated by said reference signal generation means (see Col. 6, line 65 to Col. 7, line 4).

As to claim 6, Okada-Emura discloses the radio communication system according to claim 2 wherein said control station comprises:

reference signal generation means configured to generate a reference signal (see Okada: Col. 7, lines 30-36); and

reference signal transmission means configured to directly transmit the generated reference signal for superposing the reference signal to said sub carrier multiplexing signal and transmitting the signal to said base station (see Okada: Col. 8, lines 5-13), and

said base station side frequency conversion means and said control station side frequency conversion means perform the frequency conversion based on the same reference signal generated by said reference signal generation means (see Okada: Col. 7, lines 30-36 and lines 43-57).

As to claim 7, Okada-Emura discloses the radio communication system according to claim 1 wherein said control station comprises:

addition means configured to superpose a signal correlated with the transmitted signal transmitted to said radio communication terminal from said variable beam pattern array antenna and a signal correlated with said weighting coefficient (see Okada: Col. 8, lines 5-13); and

control station side transmission means configured to transmit the signal superposed by said addition means to said base station (see Okada: Col. 8, lines 5-13),

said base station comprises:

first branching means (24) configured to branch the signal transmitted from said control station to the signal correlated with said transmitted signal, and the signal correlated with said weighting coefficient (see Okada: Col. 7, lines 43-50);

second branching means (25) configured to branch the branched signal correlated with said transmitted signal to the same number as the number of said antenna elements (see Okada: Col. 7, lines 43-50); and

base station side weighting means configured to weight the signals correlated with said transmitted signal and branched by said second branching means based on a weighting control signal correlated with said weighting coefficient (see Okada: Col. 7, lines 51-57);

wherein said antenna elements transmit the respective signals subjected to the base station side weighting means to said radio communication terminals (see Okada: Col. 7, lines 51-57).

As to claims 10 and 11, Okada-Emura discloses the radio communication system according to claims 1 and 2 wherein

said base station comprises the variable beam pattern array antenna constituted of first to n-th antenna elements (n is a positive integer) (see Okada: Col. 5, lines 18-24),

at least one of said base station and said control station comprises phase compensation means configured to compensate a phase fluctuation amount generated by a signal propagation path between said base station and said control station, and a signal processing on the side of said base station and said control station (see Okada: Col. 5, line 58 to Col. 6, line 7 and Col. 7, lines 30-57), and

said phase compensation means establish a relation $\Phi_1+2m_1\pi = \Phi_2+2m_2\pi = \Phi_3+2m_3\pi = \ldots = \Phi_n+2m_n\pi$ ($m_1, \ldots, m_n$ are integers) in respective phase change amounts Φ_1 to Φ_n in blocks of said antenna elements disposed on said base station and said weighting means disposed on said control station with respect to the received signal of said variable beam pattern array antenna and the transmitted signal to said variable beam pattern array antenna (see Okada: Col. 6, lines 8-38).

As to claim 13, Figure 2 in Okada shows a radio communication system comprising:

a base station (2) provided with an array antenna including a plurality of antenna elements (3a, 3b, ..., 3n) (see Col. 5, lines 18-24); and

a control station (1) provided with a beam forming network for deriving a desired signal from a received signal of said variable directional array antenna (see Col. 6, lines 8-30),

said base station being connected to said control station via an optical transmission line (4),

wherein an electric signal received by said plurality of antenna elements is transmitted to said control station from said base station via said optical transmission line ("the wavelength

multiplexer 21 serves to divide a light beam transmitted through an optical fiber on a wavelength basis and includes, for example, optical filters and photo-couplers. The antenna element drivers 23i each include mixers, amplifiers and a circulator, and serve to drive the element antennas 3i. The mixer serves to convert the frequency of radio waves from a 1.5 GHz band to a 60 GHz band for radiation of the radio waves from the element antenna 3i" (Col. 5, lines 25-33)).

However, it does not disclose the signal transmitted via said optical transmission line is constituted by multiplexing an electric signal obtained by subjecting the electric signal received by said plurality of antenna elements to frequency conversion to different frequencies by a plurality of local oscillator outputs different in frequency from one another, with said local oscillator outputs.

The Emura reference teaches the signal transmitted via said optical transmission line is constituted by multiplexing an electric signal obtained by subjecting the electric signal received by said plurality of antenna elements to frequency conversion to different frequencies by a plurality of local oscillator outputs different in frequency from one another, with said local oscillator outputs ("the frequency-converted signals from frequency converters 211 to 214 may be electrically combined into a combined electrical signal which may then be converted to an optical signal by a single electrical-to-optical converter, rather than being converted to optical signals by each of electrical-to-optical signals by each of electrical-to-optical converters 221 to 224 as in the illustrated embodiment" (Col. 6, lines 58-65)); and transmission means configured to transmit said sub-carrier multiplexing signal to said base station via said optical transmission line (see Col. 6, lines 58-65 and Figure 1)).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Okada wherein the signal transmitted via said optical transmission line is constituted by multiplexing an electric signal obtained by subjecting the electric signal received by said plurality of antenna elements to frequency conversion to different frequencies by a plurality of local oscillator outputs different in frequency from one another, with said local oscillator outputs, as taught by Emura, in order to generate a combined electrical signal which may then be converted to an optical signal by a single electrical-to-optical converter for transmission.

7. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0843380 A2 to Okada et al. in view of Emura (U.S. Patent 5,424,864) in view of Taruki et al. (JP 09-215047) (machine translation) and further in view of Sano (U.S. Patent 5,697,083).

As to claim 8, Okada-Emura discloses the radio communication system according to claim 7 wherein

said base station comprises:

first optical /electric conversion means configured to convert a first optical signal transmitted from said control station via said transmission line to an electric signal (Okada: see Col. 7, lines 37-42 and Figure 5);

separation means (24) configured to separate the electric signal converted by the first optical /electric conversion means to the transmitted signal for said radio communication terminal and a beam control signal for controlling the radiation beam pattern of said variable beam pattern array antenna (see Okada: Col. 7, lines 43-50);

antenna control means (27a, 27b, …, 27n) configured to control the radiation beam pattern of a transmission/reception beam of said variable direction antenna based on said beam control signal (Okada: see Col. 7, lines 51-57);

base station side transmission means (27a, 27b, …, 27n) configured to transmit the transmitted signal for said radio communication terminal to said radio communication terminal via said variable beam pattern array antenna (Okada: see Col. 7, lines 51-57);

first electric /optical conversion means configured to optically modulate the signal subjected to frequency multiplexing by said sub-carrier multiplexing signal generation means to generate a second optical signal, and transmitting the second optical signal to said control station via said optical transmission line (Okada: see Figure 5, "E/O" block in base station 2B); and

base station side transmission frequency conversion means configured to convert the transmitted signals for said radio communication terminal separated by said separation means to a radio frequency signal and supplying the radio frequency signal to said base station side transmission means (Okada: see Col. 7, lines 43-57), and

said control station comprises:

second optical/electric conversion means configured to convert said second optical signal transmitted from said base station to the electric signal (Okada: see Col. 7, line 58 to Col. 8, line 4 and Figure 5);

control station side frequency multiplexing means configured to multiplex the transmitted signal for said radio communication terminal and said beam control signal (Okada: see Col 8, lines 5-13); and

second electric/optical conversion means configured to optically modulate the signal multiplexed by said control station side frequency multiplexing means to generate said first optical signal, and transmitting the first optical signal to said base station via said optical transmission line (Okada: see Col 8, lines 5-13).

However, Okada-Emura does not disclose demultiplex means configured to divide the electric signal converted by said second optical/electric conversion means to said plurality of frequency signals before multiplexing; control station side transmission frequency conversion means configured to convert the respective signals divided by said demultiplex means to the signals of the same frequency; weighting means configured to weight the signals subjected to the frequency conversion by said third frequency conversion means with respect to a phase and a signal intensity; combiner means configured to combine the respective signals weighted by said weighting means; demodulation means configured to demodulate the received signal based on the signal combined by said combiner means; level detection means configured to detect a maximum intensity and/or an intensity distribution of the signals subjected to the frequency conversion by said control station side frequency conversion means, and generating said beam control signal based on the detection result.

The Taruki reference (Figure 1) teaches demultiplex means (22) configured to divide the electric signal converted by said second optical/electric conversion means to said plurality of frequency signals before multiplexing (see page 3 of 8, paragraph [0027], lines 22-23); level detection means (63) configured to detect a maximum intensity and/or an intensity distribution of the signals subjected to the frequency conversion by said control station side frequency

conversion means, and generating said beam control signal based on the detection result (see page 3 of 8, paragraph [0027], lines 25-30).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Okada-Emura wherein the control station comprises demultiplex means configured to divide the electric signal converted by said second optical/electric conversion means to said plurality of frequency signals before multiplexing; and level detection means configured to detect a maximum intensity and/or an intensity distribution of the signals subjected to the frequency conversion by said control station side frequency conversion means, and generating said beam control signal based on the detection result, as taught by Taruki, in order to select radio signal of higher quality from plurality of signals.

The Sano reference (Figure 1) teaches weighting means configured to weight the signals subjected to the frequency conversion by said third frequency conversion means with respect to a phase and a signal intensity ("weight signal generator 300" in Col. 7, lines 20-32); combiner means configured to combine the respective signals weighted by said weighting means ("adder 110" in Col. 6, lines 27-39 and Col. 2, lines 5-7); demodulation means configured to demodulate the received signal based on the signal combined by said combiner means ("detector 400" in Col. 6, lines 27-39 and Col. 2, lines 7-8).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Okada-Emura-Taruki wherein the control station comprises weighting means configured to weight the signals correlated with the respective frequency signals divided by said demultiplex means with respect to a phase and/or a signal intensity; combiner means configured to combine the respective signals weighted by said

weighting means; demodulation means configured to demodulate the received signal based on the signal combined by said combiner means, as taught by Sano, in order to implement the maximal-ratio combining method to provide highest signal-to-noise ratio after combining and thus improve signal quality.

As to claim 9, Okada-Emura-Taruki-Sano discloses the radio communication system according to claim 8 wherein

said base station comprises received signal selection means (56) configured to select some signals from signals correlated with the respective received signals received from said radio communication terminal via said plurality of antenna elements based on said beam control signal (Taruki: see page 3 of 8, paragraph [0027], lines 15-18 and Figure 1), and

said frequency multiplexing means multiplex only the signals selected by said received signal selection means (Taruki: see page 3 of 8, paragraph [0027], lines 15-18 and Figure 1).

8. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 09-215047 to Taruki et al. (machine translation) in view of Sano (U.S. Patent 5,697,083).

As to claim 14, Figure 1 in Taruki shows a radio communication system comprising: a base station (3) for performing radio communication with a radio communication terminal; and a control station (2) connected to the base station via an optical transmission line (4, 5) ((see page 3 of 8, paragraph [0026]), wherein

said base station comprises:

a plurality of antenna elements (47, 48) different in directivity from one another;

first optical /electric conversion means (34) configured to convert a first optical signal transmitted from said control station via said optical transmission line to an electric signal (see page 3 of 8, paragraph [0027], lines 7-10);

separation means (65) configured to separate the electric signal converted by the first optical /electric conversion means to a transmitted signal for said radio communication terminal and an antenna selection signal for selecting said plurality of antenna elements (see page 3 of 8, paragraph [0027], lines 10-14);

antenna control means (64) configured to select any one of said plurality of antenna elements based on said antenna selection signal to control the antenna element (see page 3 of 8, paragraph [0027], lines 12-14);

transmission means (43) configured to transmit the transmitted signal for said radio communication terminal to the radio communication terminal via said antenna element (see page 3 of 8, paragraph [0027], lines 10-14);

first frequency multiplexing means (56) configured to subject signals correlated with respective received signals received from said radio communication terminal via said antenna element to frequency multiplexing (see page 3 of 8, paragraph [0027], lines 15-18); and

first electric /optical conversion means (35) configured to optically modulate the signal subjected to the frequency multiplexing by the frequency multiplexing means to generate a second optical signal, and transmitting the second optical signal to said control station via said optical transmission line (5) (see page 3 of 8, paragraph [0027], lines 17-22), and

said control station comprises:

second optical/electric conversion means (17) configured to convert said second optical signal transmitted from said base station to the electric signal (see page 3 of 8, paragraph [0027], lines 19-22);

demultiplex means (22) configured to divide the electric signal converted by said second optical/electric conversion means to said plurality of frequency signals before multiplexing (see page 3 of 8, paragraph [0027], lines 22-23);

level detection means (63) configured to detect a maximum intensity and/or an intensity distribution of the signals correlated with the respective frequency signals divided by said demultiplex means, and generating said antenna selection signal based on the detection result (see page 3 of 8, paragraph [0027], lines 25-30);

second frequency multiplexing means (62) configured to multiplex the transmitted signal for said radio communication terminal with said antenna selection signal (see page 3 of 8, paragraph [0027], lines 2-4); and

second electric/optical conversion means (16) configured to optically modulate the signal multiplexed by said second frequency multiplexing means to generate said first optical signal, and transmitting the first optical signal to said base station via said optical transmission line (see page 3 of 8, paragraph [0027], lines 4-7).

However, the Taruki reference does not disclose weighting means configured to weight the signals correlated with the respective frequency signals divided by said demultiplex means with respect to a phase and/or a signal intensity; combiner means configured to combine the respective signals weighted by said weighting means; demodulation means configured to demodulate the received signal based on the signal combined by said combiner means. The Sano

reference (Figure 1) teaches weighting means configured to weight the signals correlated with the respective frequency signals divided by said demultiplex means with respect to a phase and/or a signal intensity ("weight signal generator 300" in Col. 7, lines 20-32); combiner means configured to combine the respective signals weighted by said weighting means ("adder 110" in Col. 6, lines 27-39 and Col. 2, lines 5-7); demodulation means configured to demodulate the received signal based on the signal combined by said combiner means ("detector 400" in Col. 6, lines 27-39 and Col. 2, lines 7-8).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Taruki wherein the control station comprises weighting means configured to weight the signals correlated with the respective frequency signals divided by said demultiplex means with respect to a phase and/or a signal intensity; combiner means configured to combine the respective signals weighted by said weighting means; demodulation means configured to demodulate the received signal based on the signal combined by said combiner means, as taught by Sano, in order to implement the maximal-ratio combining method to provide highest signal-to-noise ratio after combining and thus improve signal quality.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Ariyavisitakul et al. (U.S. Patent 5,936,754) discloses transmission of CDMA signals over an analog optical link.

b. Stilling et al. (U.S. Patent 5,838,474) discloses process and circuit arrangement for transmitting received signals from an antenna to a base station of a radio system.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duy K Le whose telephone number is 703-305-5660. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward F Urban can be reached on 703-305-4385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Duy Le
May 26, 2004

EDWARD F. URBAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600